

**CLINICAL EFFECTIVENESS OF PHYTOTHERAPY IN PATIENTS WITH CHRONIC PERIODONTITIS**

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Periodontitis is a chronic, inflammatory disease of the teeth supporting tissues caused by specific microorganisms of the oral biofilm, and the development of periodontitis is conditioned by immune and inflammatory reactions that can be influenced by numerous accessory factors. The gold standard in the treatment of periodontitis is basic therapy, which involves the removal of etiological factors, primarily oral biofilm, and in addition to mechanical control, chemical measures of oral biofilm control were also considered, which can be used as an adjunct to mechanical therapy in preventing the occurrence and development of periodontal diseases. Phytopreparations can be used for this purpose due to numerous advantages compared to chemical ones.

Evaluation of the effectiveness of the phytopreparation Propoherb G® as a supplement to mechanical therapy in subjects with chronic periodontitis through the monitoring of clinical parameters (bleeding index BI, depth of periodontal pockets PPD, level of epithelial attachment CAL).

Sixty systemically healthy subjects aged between 30 and 50 with a diagnosis of chronic periodontitis participated, divided into two groups: SRP group = basic therapy (n=30), and phytotherapy group = SRP + Propoherb G® (n=30). Clinical parameters, PPD, CAL and BI were measured at the beginning and after the end of therapy (11th day after SRP) by a periodontist.

It was shown that the local use of phytopreparations as an adjunct to basic therapy leads to a statistically significant decrease in PPD and CAL values ( $p < 0.05$ ) in contrast to the group where only basic therapy was performed, where PPD and CAL values did not show a significant difference ( $p > 0.05$ ). BI values decreased statistically significantly in both groups after treatment.

The use of the phytopreparation Propoherb G as an adjunct treatment to the basic therapy leads to an improvement in the clinical parameters of BI, PPD and CAL.

**Key words:** periodontitis, oral biofilm, basic therapy, phytotherapy, clinical parameters

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## KLINIČKA EFIKASNOST FITOTERAPIJE KOD PACIJENATA SA HRONIČNIM PARODONTITISOM

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Parodontitis predstavlja hronično, inflamatorno oboljenje potpornog aparata zuba uzrokovano specifičnim mikroorganizmima oralnog biofilma, a razvoj parodontitisa je uslovljen imunološkim i inflamatornim reakcijama na koje mogu uticati brojni akcesorni faktori. Zlatni standard u terapiji parodontitisa je bazična terapija koja podrazumeva uklanjanje etioloških faktora, prvenstveno oralnog biofilma, a pored mehaničke kontrole razmatrane su i hemijske mere kontrole oralnog biofilma koje se mogu koristiti kao dopuna mehaničkoj terapiji u sprečavanju nastanka i razvoja parodontalnih oboljenja. Fitopreparati se zbog brojnih prednosti u odnosu na hemijske mogu koristiti sa tim ciljem. Procena efikasnosti fitopreparata Propoherb G® kao dopunskog sredstva

mehaničkoj terapiji kod ispitanika sa hroničnim parodontitisom kroz praćenje kliničkih parametara (indeks krvarenja BI, dubina parodontalnih džepova PPD, nivo epitelnog pripoja CAL). U studiji je učestvovalo 60 sistemski zdravih ispitanika između 30 i 50 godina sa dijagnozom hroničnog parodontitisa podeljenih u dve grupe: SRP grupa = bazična terapija (n=30), i fitoterapijska grupa = SRP + Propoherb G® (n=30). Klinički parametri, PPD, CAL i BI su mereni na početku i nakon završene terapije (11-og dana nakon SRP) od strane jednog parodontologa. Pokazano je da lokalna upotreba fitopreparata kao dodatak bazičnoj terapiji dovodi do statistički značajnog smanjenja PPD i CAL vrednosti ( $p < 0.05$ ) za razliku od grupe gde je rađena samo bazična terapija gde vrednosti PPD i CAL nisu pokazale značajniju razliku ( $p > 0.05$ ). Vrednosti BI su se statistički značajno umanjile u obe grupe nakon tretmana. Upotreba fitopreparata Propoherb G kao dodatnog tretmana bazičnoj terapiji dovodi do poboljšanja kliničkih parametara BI, PPD i CAL.

**Ključne reči:** parodontitis, oralni biofilm, bazična terapija, fitoterapija, klinički parametri

## Introduction

Periodontitis is a chronic, destructive, inflammatory disease of the teeth supporting structures caused by specific microorganisms or groups of microorganisms, where there is a disruption of homeostasis, which is necessary for the appropriate immune response of the host (1–3). Periodontitis destroys the supporting tissues, which includes gingiva, periodontal ligament, cementum and alveolar bone, and is the main cause of tooth loss, and can also lead to systemic health disorders if not treated (4–9). Although considered a multifactorial disease, oral biofilm plays a primary role in the development of periodontitis (1,10). Oral biofilm is made up of numerous, aggressive microorganisms that adhere to the tooth surface (11,12). The development of periodontitis in an individual is conditioned by immune and inflammatory reactions between him and oral biofilm bacteria, which can be influenced by numerous local and general factors (13–15).

The gold standard in the treatment of periodontitis is basic or mechanical therapy, which involves the removal of etiological factors, primarily the oral biofilm. The ideal goal of the therapy would be to reduce periodontal pocket depth (PPD) and epithelial attachment level (CAL). The treatment is based on non-surgical mechanical debridement (SRP) with hand instruments and/or an ultrasound device and appropriate maintenance of oral hygiene. Frequent monitoring of the progression and recurrence of periodontal diseases, removal of oral biofilm and proper maintenance of oral hygiene are considered conventional treatment methods until today. However, despite the numerous clinical advantages of the conventional treatment method, clinical improvement does not always occur, especially if patients have deep periodontal pockets or have some systemic chronic diseases. For the above reasons, efforts are still being made to find alternatives that would complement the shortcomings of the conventional treatment method (1,10,16). Therefore, in addition to mechanical control of oral biofilm, chemical biofilm control measures have been considered that can be used as an adjunct to mechanical therapy, which together can control the formation of biofilm and influence the onset and progression of periodontal diseases (11,17). Numerous studies have documented the effectiveness of chemical preparations and their application in “hard-to-reach” areas in the oral cavity for removing oral biofilm, as well as their impact on the recolonization of microorganisms in the biofilm (18–20). Antimicrobial rinses can reduce bacterial adhesion to the tooth surface or affect the growth and division of microorganisms (18,21). Chlorhexidine (CHX) is currently the best-known chemical,

antimicrobial agent used in the prevention and treatment of periodontal diseases (22). However, its long-term use can lead to unwanted effects such as discoloration of teeth and restorations, taste disturbances, unpleasant sensations in the mouth, and allergic reactions (18,23). For the above reasons, alternative methods with minimal side effects are still being researched around the world. Phytopreparations have been used as medicines for centuries due to their biological activities, including antioxidant, anti-inflammatory and antimicrobial properties (24). One of the oldest methods in medicine, which has attracted attention again recently, is the use of phytopreparations for the treatment of caries, gingivitis, periodontitis, peri-implantitis and dentin hypersensitivity (25). Medicinal plants contain various essential phytochemical compounds, including tannins, alkaloids, saponins, glycosides, steroids, terpenoids, flavonoids, phlobatannins, anthraquinones, etc. which are known for their antimicrobial effect and wound healing properties (11,26,27). Herbal preparations are generally preferable to chemical ones, given that they are available at much lower prices and have no, or minimal side effects (18,28). Considering the many benefits, phytopreparations can be used as an adjunct method to mechanical therapy in the treatment of inflammatory periodontal diseases.

### **The aim**

Due to the increased popularity and the potential benefit of herbal preparations, the aim of this research was to evaluate the effect of the phytopreparation Propoherb G® from the Institute for the Study of Medicinal Plants "Dr. Josif Pančić", Belgrade, Serbia as adjuvant to mechanical therapy in subjects with chronic periodontitis measured by clinical parameters (bleeding index BI, periodontal pocket depth PPD, epithelial attachment level CAL).

### **Material and method**

A clinical prospective study was conducted at the Department of Periodontology and Oral Medicine, Clinic of Dentistry, Faculty of Medicine, University of Niš. The Ethics Committee approved the study protocol (number 12-3588-2/1). The study involved 60 systemically healthy subjects between the ages of 30 and 50 with a diagnosis of chronic periodontitis with the following clinical symptoms: gingival inflammation, presence of periodontal pockets 3.5 to 5.5 mm deep (PPD), loss of epithelial attachment of 2 mm (CAL) and the presence of supra- and subgingival dental deposits. The exclusion criteria for the research were the following: the existence of systemic or autoimmune diseases that affect the course of the disease, the use of antibiotics,

anti-inflammatory drugs and locally applied preparations in the last 3 months, the period of pregnancy and lactation, heavy smokers, under the age of 18, subjects with acute or chronic infections, or who have undergone radiation or chemotherapy. It was necessary to have at least 10 teeth in each jaw. Before the beginning of the study, all subjects were informed in detail about the procedures required to perform this study and only those who gave written consent were included in the study. After signing the consent, all subjects were randomly assigned to the SRP group - in which the basic therapy was performed (n=30), and the phytotherapy group in which, in addition to the basic treatment, the SRP + Propoherb G® phytotherapy was also performed (n=30). The ingredients of Propoherb G are as follows: highly purified concentrated extract of propolis (2%), mixture of extracts of sage leaf, chamomile flower and buckthorn leaf (20%), concentrated extract of rosehip (2%), essential oil of mint (0.2%), honey, polysorbate 20, potassium sorbate and water.

All subjects were undergone to standard basic therapy, which included the identification and removal of oral biofilm and other deposits from the teeth using paste for removing soft deposits and rotating brushes, removal of supra- and subgingival calculus with an ultrasound device and a sickle hand instrument, treatment of the tooth root surface with a small sickle instrument, treatment of the soft periodontal pocket wall with a periodontal curette rinsing with 3% hydrogen peroxide, motivation and training of subjects for maintenance oral hygiene and the elimination of possible risk factors that contribute to the accumulation of dental plaque. In the second group subjects, phytotherapy with Propoherb G® solution from the Institute for the Study of Medicinal Plants "Dr. Josif Pančić", Belgrade, Serbia was carried out after the basic treatment. The preparation was applied with the syringe and a needle in a volume of 0.1 ml per periodontal pocket. Periodontal and phytotherapy was carried out for ten consecutive days and all subjects received instructions for adequate maintenance of oral hygiene. Clinical parameters, periodontal pocket depth PPD, attachment epithelium level CAL and Muhlemann bleeding index (BI) were measured at the beginning and after the end of therapy (11th day after SRP) by a one periodontist. In all subjects, the therapy was carried out to the end and there were no reported unwanted effects during the study.

Data were analyzed using the SPSS 17 software Windows package (SPSS, Inc., Chicago, IL). Parameters were calculated as mean value and standard deviation. For independent samples, Student's t-test was used to determine the existence of a statistically significant difference in

values for both groups. Friedman and Mann-Whitney test were used as post hoc tests for intergroup analysis. The results are tabulated, and statistical significance was set at  $p < 0.05$ .

## Results

In this research participated 60 subjects randomly divided into two groups: SRP group (10 women and 20 men) with a mean age of  $39.5 \pm 10.15$  and Propoherb G+SRP group (14 women and 16 men) with a mean age of  $43.25 \pm 6.99$ . Of these 60, 24 (40.0%) were female, and 36 (60.0%) were male. The mean age value of the subjects was ( $41.38 \pm 8.62$ ). There was no statistically significant difference in age and gender (T-test) between the examined groups (Table 1).

Table 1. Demographic characteristics of the examined groups - (results are presented in the form of percentages and mean values  $\pm$  SD)

Variable	SRP Th	Propoherb G+ SRP Th	Total	<i>p</i> value
<b>Gender (n, %)</b>				
<b>Total</b>	<b>30</b>	<b>30</b>	<b>60</b>	<b>p=0,51</b>
<b>Women</b>	<b>10 (33,3%)</b>	<b>14 (46,7%)</b>	<b>24 (40.0%)</b>	<b>NS</b>
<b>Men</b>	<b>20 (66,7%)</b>	<b>16 (53,3%)</b>	<b>36 (60.0%)</b>	
<b>Age</b>	<b>39.5 <math>\pm</math> 10.15</b>	<b>43.25 <math>\pm</math> 6.99</b>	<b>41.38 <math>\pm</math> 8.62</b>	<b>p=0.57</b>
<b>(mean value)</b>				<b>NS</b>

Mean value  $\pm$  SD,  $p < 0.05$  – statistic significance. SD – Standard deviation NS – is not significant

In the SRP group before the start of therapy, the mean value of BI index was 1.35, PPD value 3.23 mm and CAL value 2.86 mm, while in the second group the values were BI 1.67, PPD 3.52 mm and CAL 2.85 mm. Before the start of the therapy, there was no statistically significant difference in the examined parameters between the groups (Table 2).

Table 2: Comparison of periodontal disease parameters before the start of therapy between groups

Initial Parameters	SRP Th (n=30)	Propoherb G+SRP (n=30)	p value
BI	1.35±0.4	1.67±0.6	p=0.54
PPD (mm)	3.23±0.51	3.52±0.52	p=0.58
CAL (mm)	2.86±0.63	2.85±0.6	p=0.62

PPD – periodontal pocket depth, CAL – attachment epithelium level, BI –Muhlemann bleeding index; Mean value ± SD.  $p < 0.05$  – statistic significant. SD – Standard deviation

Comparisons of values within groups before and after treatment showed the following results: in the SRP group before the start of therapy, the mean value of the BI index was 1.35±0.4, and after treatment 0.52±0.5, while in the other group these values were before therapy 1.67±0.6 and after therapy 0.15±0.07 with a statistically significant difference in both groups (Table 3). In the first group, PPD was 3.23 mm at the beginning of therapy, and 3.20 mm after therapy, and this difference was not statistically significant. Also, the mean value of CAL before therapy was 2.86 mm, and after 2.84 mm, this difference was not statistically significant. In the second therapy group, PPD at the beginning of therapy was 3.52 mm, and after therapy it was 3.00 mm, and this difference was statistically significant. The mean value of CAL at the beginning was 2.85 mm, and after therapy 2.43 mm and the difference was statistically significant (Table 4, Table 5).

Table 3: Comparison of parameters within groups: bleeding index - Muhlemann (BI)

Study groups	BI (before therapy)	BI (after the 10 day)	p value
Group I (SRP Th)	1.35±0.4	0.52±0.51	0,02*
Group II (SRP Th+ Propoherb G)	1.67±0.6	0.15±0.07	0,03*

Mean value ± SD, .  $p < 0.05$  – statistic significant. \* - significant values SD – Standard deviation

Table 4: Comparison of parameters within groups: periodontal pocket depth (PPD)

Study groups	PPD (mm) (before therapy)	PPD (mm) (after the 10 day)	p value
Group I (SRP Th)	3.23±0.51	3.20.±0.46	0.55
Group II (SRP Th+ Propoherb G)	3.52±0.52	3.00±0.07	0,03*

Mean value ± SD,  $p < 0.05$  – statistic significant \* -statistic value SD – Standard deviation

Table 5: Comparison of parameters within groups: epithelial attachment level (CAL)

Study groups	CAL (mm) (before therapy)	CAL (mm) (after the 10 day)	p value
Group I (SRP Th)	2.86±0.63	2.84±0.46	0.55
Group II (SRP Th+ Propoherb G)	2.85±0.6	2.43±0.45	0,01*

Mean value ± SD,  $p < 0.05$  – statistic significant \* -statistic value SD – Standard deviation

The results of the comparison of values after treatment between groups showed that there was a statistically significant decrease in values in the second therapeutic group ( $p < 0.05$ ) (Table 6).

Table 6: Comparison of periodontal parameters after therapy between groups

Initial Parametres	SRP Th (n=30)	Propoherb G+SRP (n=30)	p value
BI	0.52±0.51	0.15±0.07	0,01*
PPD (mm)	3.20±0.46	3.00±0.07	0.03*
CAL (mm)	2.84±0.46	2.43±0.45	0.01*

Mean value ± SD,  $p < 0.05$  – statistic significant \* -statistic value SD – Standard deviation

The results showed that the local use of phytopreparation (Propoherb G) as an adjunct to the basic, convectional therapy of chronic periodontitis leads to a statistically significant decrease in PPD and CAL values ( $p < 0.05$ ) in contrast to the group where only basic therapy was performed, where

PPD values and CAL did not show a significant difference ( $p>0.05$ ). BI values decreased statistically significantly in both groups after the treatment.

## Discussion

In accordance with scientific achievements, our knowledge of etiology, pathogenesis and clinical picture of periodontal diseases is constantly changing, and therefore the concept of treating them is also changing. Due to the ability of microorganisms to invade and their nature to penetrate the periodontium tissues, it was considered that only mechanical therapy was sufficient, however antimicrobial therapy as an adjunct to mechanical therapy occupies a lot of attention in the therapy of periodontal disease.

Oral biofilm is the main etiological factor in the occurrence of gingivitis and periodontitis, so mechanical control of biofilm is the best approach for its elimination, however, it requires exceptional training and meticulousness, For the above, but also for numerous other reasons, investigations were conducted in search of an adequate preparation that would complete the action of mechanical therapy. Numerous chemotherapeutic agents have been presented and investigated in the literature, but most of them have been shown to have side effects when used over a long period of time. The growing interest in a healthier way of life and preservation of the environment has forced the need for demand for natural products, especially those containing plant extracts (29).

Herbal products have been used for centuries to maintain oral hygiene and in the treatment of gum disease, such as cloves, turmeric, aloe vera, green tea, cinnamon and others. They generally have no side effects and are extremely valued because they show antimicrobial, antioxidant, antiseptic, anti-inflammatory properties and, due to their anti-collagenase activity, they can potentially influence wound healing. (29,30). They are favored over traditional chemical preparations, not only because of their biological activity, but also because of their safety and lower cost. Long-term use of convection preparations can lead to numerous adverse drug reactions, side effects and resistance (31–34).

In recent years, there have been numerous attempts to test plants and their products in order to prove their specific anti-plaque effect because they represent an attractive potential as an adjunct to mechanical, basic therapy. Phytotherapy can be carried out in combination with convectional preparations or independently, depending on the condition. Due to numerous benefits, availability,

minimal number of unwanted effects and low price, phytopreparations represent an excellent option in controlling dental biofilm and the progression of periodontal diseases (35,36). However, research in the field of herbal products is still in its infancy.

The results of this research showed the advantages of using the phytopreparation Propoherb G as an adjunct to basic therapy in the treatment of periodontal disease, measured through clinical parameters: BI, PPD and CAL. In all clinical parameters, there was an improvement in the mentioned values in the examined interval, which is in agreement with numerous investigations of phytopreparations that were used in different forms with the aim of preventing and preventing the progression of periodontal diseases. Studies conducted by Mahyari S. et al. (2016), Vangipuram S. et al. (2016), Chhina S. et al. (2016), Chatterjee A. et al. (2017), Irfan M. et al. (2018), Nayak. et al. (2019), Sparabombe S. et al. (2019), Gouthami et al. (2019), Malekzadeh M et al. (2020), Mangesh G et al. (2022), and Kim YR et al. (2022), investigated individually the effects of different plant-based mouthwashes, namely turmeric, aloe vera, green tea and guava leaf extract. The results of the studies showed the effectiveness of the phytopreparations in reducing the value of PI, GI, BOP with a significant improvement in of the periodontal supported tissues. Improvements occurred with no reported adverse effects compared to chlorhexidine (CHX) (11, 37–48). Research conducted by Singh A. et al. (2018), Siddharth M et al. (2020), and Pérez-Pacheco, CG et al. (2021) examined the clinical parameters of PI, GI and PPD in groups with basic therapy, herbal preparations and chlorhexidine. Findings showed significant improvements in values such as BOP, PPD, and CAL and a reduction in inflammatory mediators when they applied into the periodontal pocket, as opposed to using 0.2% CHX gel. (11, 49–52). Bhat et al. (2011), indicated that subgingival injectional application of aloe vera extract in the form of a gel can led to an improvement in periodontal health. Considering these results, it could be concluded that aloe vera extracts, due to their antioxidant properties, could be useful in the prevention and treatment of periodontal diseases (53). Yaghini et al. (2014) conducted a randomized double-blind controlled study to evaluate the final clinical outcome after subgingival application of an herbal gel (oak and coriander extracts). The results showed statistically significant improvements in the examined periodontal clinical parameters (54). Similarly, clinical trials have shown that available essential oil-based mouthwashes are also effective in controlling oral biofilm and gingivitis (55–60) reducing biofilm between 13% and 56% and gingivitis by 14% and 40%. during a six-month study (55,61). As previously mentioned, herbal rinses have been shown to reduce gingival bleeding and gingivitis progression (55,62), therefore the use of any

herbal mouthwash provides benefits in terms of suppression of oral biofilm formation and improvement of clinical symptoms in subjects with chronic periodontitis.

Data obtained from the literature indicate that different phytopreparations, the way and time of their application in periodontitis therapy, similar to the results of our study, give encouraging results, however, further research is needed to clarify the potential application of phytopreparations in the prevention and treatment of periodontal diseases. The combination of convectional periodontal treatment and phytotherapy has not yet been introduced into the protocol for the treatment of patients with chronic periodontitis.

### **Conclusion**

Based on the obtained results, it can be concluded that the use of the phytopreparation Propoherb G as an additional treatment to the basic therapy leads to a statistical improvement in the mean values of BI, PPD and CAL in the observed period. The use of phytopreparations could bring better clinical results if it is carried out in combination with the convectional method of treatment, but it is necessary to do more studies that would include a larger number of subjects, with a longer period of observation in order to find the appropriate method of their application. Future research should develop standardized protocols to identify the effect of different herbal products used in dentistry.

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